D.P.U. 94-2/3-CC

Joint application of Cambridge Electric Light Company and Commonwealth Electric Company for approval of a change in their conservation charges to become effective July 1, 1994.

Investigation by the Department of Public Utilities, on its own motion, into the Companies' conservation charges, and the various components of those charges, including but not limited to the Companies' demand-side management monitoring and evaluation reports.

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I. INTRODUCTION

A. Scope of Proceeding

On April 1, 1994, Commonwealth Electric Company ("Commonwealth") and Cambridge Electric Light Company ("Cambridge") (collectively, "Companies") filed impact evaluations and survey data with the Department of Public Utilities ("Department") for four programs: (1) the Residential Electric Space Heat ("RESH") Program; (2) the Hot Water General Use ("HWGU") Program; (3) the Small Commercial/Industrial Direct Investment ("Small C/I") Program; and (4) the Customized Rebate Program ("CRP") (collectively, "the M&E Report"). The M&E Report provides descriptions of the Companies' impact evaluation results (i.e., estimates of energy savings) for its demand-side management ("DSM") programs that have been implemented through June 30, 1994. The results of these evaluations are used by the Companies and the Department for planning purposes and to determine the amount of lost base revenue ("LBR")[1] to be collected by the Companies.

On May 2, 1994, the Companies filed their proposed conservation charges ("CCs") for the period July 1, 1994 through June 30, 1995. On

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[1] Lost base revenues are those revenues that a company does not collect from its ratepayers because of the decrease in billing units that result from DSM program savings.

June 3, 1994, the Companies filed a Supplement ("CC Filing Supplement") to their May 2, 1994 filing providing more current information regarding the proposed CCs. The conservation charge is the mechanism whereby costs for DSM implementation are recovered.[2] The components of the CC include (1) projected DSM expenditures for the period July 1994 through June 1995, (2) projected LBR for the period July 1994 through June 1995, and (3) a reconciling adjustment of over- and under-recoveries of DSM expenditures through June 30, 1994.

In this Order, the Department determines whether the savings estimates included in the Companies' impact evaluations satisfy the criteria established by the Department for the review of such evaluations. The Department also will makes findings regarding the CC rates to be implemented by the Companies for the period July 1, 1994 through June 30, 1995.

B. Procedural History

Over the past five years, the Companies have filed several petitions for preapproval of their DSM programs.[3] In the Companies'

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[2] The CC cost recovery mechanism was originally established by the Department in Cambridge Electric Light Company/Commonwealth Electric Company, D.P.U. 89-114/90-331/91-80, at 169-70 (1991) ("D.P.U. 91-80").

[3] In D.P.U. 86-36-E (1988), the Department adopted regulations requiring Department preapproval for major investments by electric companies in generation facilities. See 220 C.M.R. §§ 9.00

second DSM preapproval filing,[4] which was submitted to the Department on April 16, 1991, they sought and received preapproval for the four programs that are the subject of this Order, i.e., the RESH Program, the HWGU Program, the Small C/I Program and CRP. Cambridge Electric Light Company/Commonwealth Electric Company, D.P.U. 91-80 Phase Two-A (1992). In that proceeding, the Department approved a Settlement which provided for, inter alia, the establishment of an Independent Expert and a Task Force in order to develop, improve and oversee DSM activities on the part of the Companies. Id. at 9-14. The third DSM preapproval filing by the Companies, on October 1, 1992, reflected a lack of consensus among members of the Task Force and contained many programs that the Companies acknowledged were not cost-effective. Cambridge Electric Light Company/Commonwealth Electric Company, D.P.U. 92-218, at 2 (1993). The Department dismissed the Companies' filing without hearing on the ground that adjudication at that time would not be in the public interest. Id.

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et seq. The Department later found that preapproval treatment was appropriate for major DSM investments. D.P.U. 86-36-F at 29 (1988). The Companies submit joint DSM preapproval filings to the Department because they perform their resource planning functions in an integrated manner.

[4] In Cambridge Electric Light Company/Commonwealth Electric Company, D.P.U. 89-242/246/247, at 31-36 (1990) ("D.P.U. 89-242"), the Department reviewed the Companies' first request for preapproval of DSM programs.

However, the Department ordered the Companies to continue implementing the RESH and HWGU Programs through July 1, 1994.[5] Id. at 18.

On May 29, 1992, by Letter Order issued in Cambridge Electric Light Company/Commonwealth Electric Company, D.P.U. 91-234,[6] the Department required the Companies to submit, by July 1, 1993, a draft request for proposals ("RFP") that would employ a competitive process to identify new DSM programs for the Companies, for implementation beginning July 1, 1994. The June 3, 1994 CC Filing Supplement incorporates detailed information regarding CC rates to recover costs for programs approved by the Department based on the DSM RFP Award Group approved on May 31, 1994 in Cambridge Electric Light Company/Commonwealth Electric Company, D.P.U. 91-234-B (1994).

On December 23, 1992, the Companies filed rate schedules M.D.P.U. No. 523 (Cambridge) and M.D.P.U. No. 276 (Commonwealth), which incorporated the Companies' request to recover LBR through their CCs. The Department's investigation of the Companies' LBR request was docketed as D.P.U. 93-15/16. Pursuant to an Order issued

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[5] The Companies suspended CRP and Small C/I activities in 1991, except for projects that were already underway.

[6] D.P.U. 91-234 is the Companies' integrated resource management ("IRM") proceeding.

by the Department on June 30, 1993, the Companies were directed to collect DSM expenses (for July 1, 1993 to June 30, 1994) and projected LBR (for January 1, 1993 to June 30, 1994) through their CCs through June 30, 1994. Cambridge Electric Light Company/Commonwealth Electric Company, D.P.U. 93-15/16 (1993). On November 1, 1993, after investigating the reconciliation of under- and over- recovery of DSM expenses from January 1, 1992 to June 30, 1993, the Department ordered the Companies' CCs revised to the current amount. Cambridge Electric Light Company/Commonwealth Electric Company, D.P.U. 93-15/16-A (1993). Finally, on January 28, 1994, the Companies submitted a "Work Plan," setting forth a suggested filing schedule for CCs that would be proposed for the period July 1, 1994 to June 30, 1995, and for the M&E Report. The Companies' Work Plan was approved by the Department on March 9, 1994.

On June 7, 1994, the Department held a public hearing regarding the proposed CCs and the M&E Report pursuant to notice duly issued. The Attorney General of the Commonwealth ("Attorney General") intervened as of right pursuant to G.L. c. 12, § 11E. IRATE, Inc. ("IRATE") sought and was granted leave to intervene. Subsequently,

IRATE requested and was permitted to amend its status to that of limited participant. Following the public hearing, a procedural conference was conducted.

Evidentiary hearings were held on June 16, 1994 and June 21, 1994. The evidentiary record consists of 19 exhibits proffered by the Company, 98 responses to information requests propounded by the Department, and 29 responses to record requests. In addition, IRATE submitted a prepared statement, and the Attorney General submitted a prepared response to this statement, both of which were admitted into the record. The Company sponsored the testimony of the following persons: Paul Fiocchi, manager of demand program administrative services; Anthony J. Casella, manager of administration for COM/Energy Services; Robert M. Hardy, systems analyst in the demand program administration; Dr. Greta Ljung, a consultant from the Massachusetts Institute of Technology Department of Mathematics; and Peter J. Spinney, a consultant from Charles River Associates.

II. THE COMPANIES' IMPACT EVALUATIONS

A. Introduction

In D.P.U. 93-15/16, the Department ordered the Companies to submit impact evaluations to support savings estimates used to calculate LBR. Id. at 15-16. On April 1, 1994, the Companies submitted impact evaluations for their four DSM programs.

The Companies employed a three-step process to develop savings estimates. First, the Companies prepared an original projection of savings estimates, based on engineering estimates and a projection of energy conservation measures ("ECMs") installed in the ensuing year. Second, the Companies calculated an initial reconciliation of savings estimates which incorporated the results of the first set of impact evaluations. The April 1, 1994 filing by the Companies reflected the first two steps of this process. Finally, the Companies will determine a final reconciliation, incorporating savings estimates produced by a second round of impact evaluations. This information will be included in the Companies' next CC filing.

This is the first Order by the Department on impact evaluation activities of the Companies. The Companies' filing included data on savings achieved since the inception of their DSM programs. However, the Department will focus its investigation on those savings estimates that are included in the Companies' calculation of LBR. The Companies' filing did not include information on demand savings estimates. The Companies indicated that this is because their LBR factor is based on energy savings. For the purpose of this proceeding, the Department's investigation will focus on energy savings estimates. However, the Companies are expected to include detailed descriptions

of the methodology used to develop demand savings estimates in their next CC filing.

B. Standard of Review

The Department has established the criteria to be used in the review of electric companies' DSM impact evaluations through a series of previous orders. To ensure the reliability of the savings estimates produced by the impact evaluations, the Department has directed companies to minimize bias in the savings estimates. Boston Edison Company, D.P.U. 90-335, at 105 (1992); Western Massachusetts Electric Company, D.P.U. 91-44, at 140, 143 (1991). The Department has found substantial bias in engineering estimates of DSM savings and, accordingly, generally has required companies to measure savings after the installation of ECMs.[7] D.P.U. 90-335, at 106; Nantucket Electric Company, D.P.U. 91-106/138, at 212-215 (1991); Massachusetts Electric Company, D.P.U. 90-261, at 79, 80, 85 (1991); D.P.U. 91-44, at 142-143.

The Department has identified some sources of bias in savings estimates, including: (1) poor selection of samples used in savings

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[7] The Department has allowed savings estimates which are not based on after-the-fact measurement for programs in which (1) only one well-defined end use is involved and the hours of operation of the installed ECMs are very predictable or controlled by a company, or (2) it can be demonstrated that no after-the-fact measurement is possible. D.P.U. 90-261, at 109; D.P.U. 90-335, at 109, n.40; D.P.U. 91-44, at 142.

measurement analyses, D.P.U. 91-44, at 138; (2) inaccurate hours-of-use estimates, D.P.U. 90-335, at 105; D.P.U. 91-44, at 142; D.P.U. 90-261, at 109, 110; (3) the failure to account for free riders, D.P.U. 90-335, at 111-112; (4) the failure to account for interactions of multiple DSM measure installations, D.P.U. 89-242, at 78-79 (1990); and (5) overestimated persistence of savings. D.P.U. 90-335, at 110-111; D.P.U. 91-44, at 147-148.

The Department has recognized that, in certain instances, the costs of obtaining more precise estimates of savings may exceed the incremental value of those more precise estimates. D.P.U. 90-261, at 100. Therefore, the Department has directed companies to pursue savings measurement activities that maximize the level of precision of the DSM savings estimates, but only to the extent that the marginal value of the more precise savings estimates exceeds the marginal cost of obtaining the additional precision. D.P.U. 90-335, at 100-103, 110; D.P.U. 90-261, at 106, 108.

The Department will accept savings estimates if it can be determined that they are sufficiently unbiased and sufficiently precise, given the nature of the program, the company's resources, and the costs and value of obtaining better precision.[8]

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[8] The Department notes that this standard of review applies specifically to the review of a Company's savings estimates. The

In Massachusetts Electric Company, D.P.U. 92-217-B (1994), the Department stated that, in future impact evaluation reviews, the Department expects to apply a standard of review that is consistent with Department precedent in this area, but which also reflects the criteria that have been established for the review of electric companies' demand forecasts.[9] Id. at 6-7. As part of the review in this proceeding, the Department will apply the review criteria described above. However, in future reviews, the Department will accept the savings estimates that are a product of an electric company's impact evaluations if the company demonstrates that the impact evaluations are reviewable, appropriate, and reliable. A company's impact evaluation filing will be considered reviewable if the record is complete, clearly presented, and contains a summary that sufficiently explains all assumptions and data presented. An impact evaluation will be considered appropriate if evaluation techniques selected are reasonable given consideration of the characteristics of a particular DSM program,

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ratemaking treatment to be afforded revenues that are calculated based on the savings estimates are addressed more appropriately in later sections of this CC Order.

9 The Department stated that this is appropriate because, similar to electric demand forecasts, DSM impact evaluations employ input data and complex methodological techniques to develop assessments that are important to the utilities' resource planning processes and to ratepayer costs. D.P.U. 92-217-B at 6-7.

the company's resources, and the available methods for determining demand and energy savings estimates.[10] Finally, the savings estimates included in an impact evaluation will be considered reliable if the estimates are sufficiently unbiased and are measured to a sufficient level of precision, again, given consideration of the characteristics of a particular DSM program, the company's resources and the available methods for determining demand and energy savings estimates. Interested parties will have the opportunity to comment on this standard of review in future proceedings.

C. Description of DSM Savings Estimation Techniques

1. Introduction

As stated in Section I, above, the savings estimates produced by the impact evaluations are used by the Companies and the Department for planning purposes and for determining the amount of LBR to be collected by the Companies in a particular year. In order to serve these purposes, the impact evaluations must produce savings estimates that (1) reflect the period of time over which the ECMs can be expected to generate savings (i.e., "lifetime" savings estimates); (2) reflect the level of demand savings that occurs at the time of, or coincident with, a

[10] The Department recognizes that the state-of-the-art in methods used to determine DSM savings estimates is evolving and expects companies to remain up to date with technological and methodological advances in this field.

company's peak power demand (i.e., "coincident" demand savings);[11] and (3) do not include the level of savings that would have occurred in the absence of implementation of the DSM programs (i.e., "net" savings estimates).[12] To determine net savings estimates, gross savings estimates must be adjusted to take into account non-program factors that may affect the electricity consumption of program participants. These factors include free-ridership,[13] spillover (additional savings that are induced by a DSM program), economic conditions (both general and firm-specific),[14] and weather.

The first step in developing energy and capacity savings estimates consists of producing engineering estimates of the savings, based on

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[11] Savings estimates that do not take into account the level of demand savings that occurs at the time of a company's peak power demand are referred to as "non-coincident" demand savings estimates.

[12] Savings estimates that include the level of savings that would have occurred in the absence of implementation of the DSM programs are referred to as "gross" savings estimates.

[13] A free rider is defined as a program participant who would have installed an ECM without direct payment from an electric company. D.P.U. 86-36-F at 25-26. A pure free rider would have spent the same amount of money to install the same energy-efficient measures at the same time without benefit of a utility company's program. A partial free rider would have spent less money, installed less equipment, installed only somewhat efficient equipment, and/or installed the equipment at a later date.

[14] Firm-specific economic conditions may include changes in floorspace, equipment, hours of operation, industrial process configuration, output, employment, and/or sales.

the number of ECMs installed. As stated in Section II.B, above, the Department has generally required companies to measure actual savings after the installation of the ECMs. Post-installation measurement techniques typically measure the savings for a sample of program participants in a particular year (the "participant group"). The results of the post-installation measurements typically are applied to the entire population of program participants in two steps. First, the measured savings estimates for the participant group are compared to the engineering estimates of savings for that same group. The ratio of the measured savings estimates to the engineering savings estimates is referred to as the "realization rate". Second, the engineering-estimated savings for the entire population of program participants are multiplied by the realization rate to determine savings estimates for the program. Depending on the post-installation measurement techniques used, these savings estimates may need to be adjusted to reflect (1) revisions to the period of time over which the ECMs can be expected to generate savings (i.e., adjustments for "savings persistence"), and (2) non-program factors that might affect customers' electricity consumption (i.e., adjustments for net savings).

The following sections describe the savings estimation techniques most commonly implemented by companies at the present time. These

techniques are engineering estimates, billing analysis, end-use metering, use of load-shape data, and surveys.

2. Engineering Estimates

Engineering estimates of annual capacity savings are determined in two steps. First, non-coincident demand savings estimates are developed based on (1) the number of ECMs installed, and (2) the difference between the power consumption, as expressed in kilowatts ("KW"), of the installed ECMs and the power consumption of alternative equipment. For retrofit applications, the power consumption of the equipment replaced by the ECMs serves as the basis for the demand savings calculation. For new construction, renovation, and remodeling applications, the demand savings calculation generally is based on the power consumption of standard-efficiency equipment that meets the standards established by building codes. Second, these estimates are adjusted by a coincident demand factor that reflects the level of demand savings that occurs at the time of a company's peak power demand.

Engineering estimates of annual energy savings are developed based on the annual non-coincident demand savings estimates and the projected hours of use of the ECMs, which generally are based on operational data reported by program participants. For ECMs whose power consumption is constant (e.g., lighting measures, ordinary

motors), energy savings estimates can be calculated simply as the product of the annual reduction in non-coincident demand and the projected hours of use of those measures. For ECMs whose power consumption varies, (e.g., heating, ventilation, and air conditioning ("HVAC") systems, variable speed drive motors, and some industrial processes) the calculation of energy savings estimates requires that one take into account the varying levels of power consumption; computer simulations are often required to determine energy savings estimates for these ECMs.

Engineering estimates of lifetime capacity and energy savings are calculated as the product of the engineering estimates of annual savings and the projected number of years over which the ECMs can be expected to generate savings, which generally are determined from manufacturer specifications.

Finally, to determine engineering estimates of net capacity and energy savings, the gross engineering estimates described above must be adjusted to take into account non-program factors that may affect the electricity consumption of program participants.

3. Billing Analysis

The simplest form of billing analysis compares the pre-installation energy consumption of a group of program participants (the "participant group"), as indicated by customer bills, to the

post-installation energy consumption of the same group.[15] The difference in energy usage between the two periods[16] is determined to be the gross annual savings that are attributable to the implementation of the DSM program.[17] Lifetime gross savings estimates are calculated as products of the annual savings estimates and the projected lifetimes of the installed ECMs.

As stated above, gross savings estimates need to be adjusted to account for non-program factors that might affect energy consumption in the post-installation period to determine net savings estimates. In order to produce net savings estimates, billing analyses may include a similar group of customers who have not participated in the DSM program (the "comparison group"). The comparison group provides information regarding what the energy consumption of program participants might have been in the absence of participation in the

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[15] Billing analysis relies on data from billing meters, which record energy consumption for all customers. For those customers whose billing meters record demand consumption (i.e., some large commercial and industrial customers), billing analyses can produce estimates of demand savings.

[16] The pre- and post-installation periods need to be long enough to account for variations (e.g., weather-related) in energy consumption.

[17] The precision of the savings estimates is determined statistically as a function of the number of customers included in the analysis (i.e., the sample sizes) and the variation in energy consumption among the sampled customers.

DSM program. Thus, billing analyses that include comparison groups can account for factors unrelated to the DSM program that affect energy consumption and, thus, may produce net savings estimates. In these analyses, the pre- and post-installation energy consumption of the participant group is compared to the pre- and post-installation energy consumption of the comparison group. Net energy savings estimates are determined by subtracting the average decrease in energy consumption for the comparison group from the average decrease in energy consumption for the participant group.[18]

The process by which the customers included in the participant and comparison groups are selected will influence the accuracy of savings estimates produced by a measurement technique. Stratification of the participant and comparison groups is a technique that can aid in selecting a participant group that is representative of the total population of program participants and in selecting a comparison group that will best reflect the savings that would have been achieved by the participant group had ECMs not been installed.[19]

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[18] Alternatively, net energy savings may be determined by applying the ratio of post- to pre-installation energy consumption for the comparison group to the difference in energy consumption over the same periods for the participant group.

[19] Customers can be stratified (i.e., sorted and assigned to categories) by level of energy consumption, household size, expected energy savings, business type, etc. Stratification also

Where selection of a comparison group that closely matches the participant group is difficult because of the diversity in the characteristics of program participants, a statistical technique called regression analysis commonly is applied to the billing data of participant and comparison groups. A regression analysis involves the construction of an equation in which the value of a dependent variable (e.g., change in energy consumption), is "predicted" by several independent variables (e.g., engineering estimate of the energy savings, firm size, heating degree days) for each "observation" (e.g., customer or month). The independent variables are selected to include factors unrelated to the DSM program that may affect post-installation energy consumption; thus, regression analyses may produce net savings estimates. Regression analysis works by minimizing the sum of the squares of the differences (commonly referred to as "residuals") between the values of the dependent variable predicted by the regression equation and the actual values. The result of such an analysis is a set of estimates of the influence of each independent variable (as represented by the "coefficients" of the independent variables) on the dependent variable. The extent to which the dependent variable is

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may be used to assign different weights to various members of the participant and comparison groups. This practice may improve the degree to which small samples of customers represent the population of program participants.

accurately predicted by the regression equation commonly is represented by two statistics: (1) R^2, which indicates the extent to which the variation in the dependent variable is explained by the regression equation; and (2) a t-ratio for each independent variable, which suggests the probability that the independent variable truly affects the dependent variable and is used to estimate the precision of the independent variable's estimated effect.[20] Many regression analyses of energy consumption use the engineering estimate of energy savings as one of the variables which explain changes in energy consumption; in these cases, the coefficient for the engineering estimate is the realization rate. Most other regression analyses (usually for programs in which each participant is expected to achieve a similar amount of savings) use program participation in place of the engineering estimate of savings; in this case, the coefficient for the participation variable is the estimated savings per participant, which can then be compared to the expected savings per participant to estimate the realization rate.

4. End-Use Metering

End-use meters typically measure the pre- and post-installation power consumption and/or hours of operation of a single piece of

[20] The coefficients, R^2, and t-ratios vary according to which independent variables are included in the regression equation and which data observation points are examined.

equipment, a circuit with several pieces of similar equipment, or a whole building to determine the reduction in demand resulting from a DSM program. The length of time that an end-use meter is employed depends on the operating characteristics of the ECMs being metered. For ECMs whose power consumption and/or hours of use are constant, end-use meters may be employed for a short period of time. For ECMs whose power consumption and/or hours-of-use varies, end-use meters should be employed over a period of time that captures the variation in power consumption and/or hours-of-use. In addition, if end-use meters are used to determine coincident demand savings, then the meters must record power consumption data at the times of a company's peak power demand.

Compared to billing analysis, end-use metering has several advantages and disadvantages. Advantages include the ability to (1) isolate actual use and load patterns of the particular ECM installed from changes in other loads, and (2) measure KW savings, which few billing meters can do. Disadvantages include (1) much higher costs per meter than billing analysis, and (2) inability to detect interactions among energy-using systems.[21] Because of the high cost associated with end-use meters, typically only a few facilities or pieces of equipment are

[21] For example, more efficient lights emit less heat, so space cooling needs are reduced.

metered. This has two ramifications. First, the sample of ECMs selected for metering must be representative of the ECMs installed through a program. Second, because comparison groups are not usually included in this type of analysis, end-use metering typically produces gross savings estimates; other methods are then required to estimate what would have occurred absent the DSM program.

Because end-use meters can isolate the impact of particular ECMs from other changes at a facility, a technique called ratio estimation sometimes can be used to obtain greater precision from a small sample than techniques used with billing analysis can, compensating for the small sample size dictated by the cost of metering. Ratio estimation techniques resemble regression analysis with one independent variable (the engineering estimate of savings), but utilize ratios of equipment-specific measured savings to the engineering estimates, in place of the differences.

5. Load Shape Data and Surveys

Load shape data[22] are sometimes used in estimating capacity savings. Load shape data show the amount of relative power

[22] Load shape data generally are based on end-use metering by a demand forecasting division or by another utility, rather than by a utility's own DSM division. Load shape data are not derived from measuring ECMs in a DSM program.

consumption[23] by various kinds of equipment, in various settings (e.g., restaurants, offices, warehouses) by time of day. Estimates of energy savings derived from billing analysis can be multiplied by appropriate factors from load shape curves to derive estimates of capacity savings.

Survey data can be applied to engineering analyses, billing analyses, and end-use metering analyses. Some surveys consist of ECM inspections, while others consist of questionnaires. Surveys may be used to estimate free riders, hours of use, coincidence factors, persistence, and inputs for computer simulation models of complex equipment systems. Thus, survey data can be used to convert gross savings estimates to net savings estimates, demand savings to energy savings, demand savings to capacity savings, annual savings to lifetime savings, and for other purposes.

D. Customized Rebate Program

1. Description

The Companies reported that the CRP was designed to address each of the major commercial and industrial electrical end uses

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[23] For example, the pattern of consumption by a water heater may show a range in hourly use from 0.1 to 1.0, with a sharp peak at 7:00 a.m. and smaller peaks at noon and 6:00 p.m. A refrigerator's hourly pattern, on the same scale, might be 0.9 to 1.2, with a slight peak at noon. Lights might consume from 0 to 2.5 on the same scale, with a broad peak from 6:00 p.m. to 10:00 p.m., and no use from midnight to 5:00 a.m. The load shape data include power consumption, energy use, and coincidence factors.

including lighting, HVAC, motors, and refrigeration (Exh. Co-5, at 1). The Companies stated that the majority of savings were achieved by lighting measures, listing 14 specific types of lighting measures that were installed (id. at 16). The Companies reported that non-lighting measures made up a large percentage of the savings in Cambridge (24 percent), a small percentage in Commonwealth's territory (less than 5 percent), and about 6 percent for the Companies combined (id. at 24-25). The Companies reported 47,359 megawatthours ("MWH") in energy savings for Commonwealth and 217 MWH in energy savings for Cambridge, for measures installed in the CRP from July 1990 through June 1994 (Exh. DPU-4-14; Exh. DPU-RR-13).

2. Techniques

The impact evaluation for CRP combined three distinct evaluation techniques: (1) engineering estimates; (2) customer surveys; and (3) billing analysis (Exh. Co-5, at 1-11). The Companies reported that they combined information gained through these approaches to determine savings estimates and to perform a statistical check of these estimates (id.). In addition, free rider effects, persistence of savings, and self-selection bias were estimated through a combination of methods. The Companies stated that one goal of this combined

approach was to reconcile the differences between estimates which result from different techniques (id.).

a. Inspection Adjusted Engineering Estimates

The Companies stated that the engineering estimates built on a detailed database of inspection results, and on prior engineering studies conducted by outside engineers under contract with the Companies (id. at 7). The Companies reported that a "rigorous" post-installation inspection procedure verified the operating hours and measures installed which contributed to degradation of anticipated savings, resulting in downward adjustments to energy savings estimates (id. at 20). The Companies claimed that, because the majority of inspections (approximately two-thirds) occurred at least 24 months after installation of the measures, the inspection results account for persistence of savings (id.; Exh. DPU-4-2).

The Companies stated that, in many instances, the accuracy of engineering savings estimates depends on two critical pieces of information: operating hours and "before" and "after" energy use for the equipment being treated with the DSM measures (Exh. Co-5, at 1). The Companies reported that the variances around these two parameters can be narrowed through site inspections to verify energy

use, and through interviews with facility operations personnel to confirm actual operating schedules (id.).

b. Customer Surveys

The Companies reported that, during the months of January and February 1994, they successfully conducted telephone surveys of 117 participants and 78 nonparticipants (id. at 32). The Companies stated that the purpose of the surveys was to determine parameters to use in calculating net savings, such as free-ridership, and to collect additional information on building operation and economic activity to use in the billing analysis (id. at 31).

Through the surveys, the Companies determined free-ridership levels for different lighting measures ranging from 2.6 percent to 18.4 percent (id. at 34). For non-lighting measures, the Companies used a "conservative" default value of 20 percent, based on a review of pertinent literature (id. at 33). The Companies stated that by applying these figures to the inspected engineering analysis savings estimates for those participants who were included in the telephone survey, they determined a net-to-gross ratio which was then applied to those participants who were not included in the telephone survey (Exh. Co-8, at 2.104).

Survey respondents were asked about changes in floor space, use of electric heat, changes in operating hours, and employment levels

since the time of efficiency improvement installations. This information was used in the billing analysis (Exh. Co-5, at 35). Other information from the survey results was used to estimate customers' propensity to participate in the CRP (id. at 36).[24]

c. Billing Analysis

The Companies stated that the goal in using billing analysis techniques was to isolate the effect of CRP from other time- and facility-related variables, and to measure the effect of CRP on monthly electric consumption (id. at 37). The Companies stated that an econometric billing analysis was performed to determine aggregate gross energy savings and to provide a check on the savings estimates developed from the inspection data (id. at 10).

The Companies developed a series of models based on billing data, and on results of the telephone surveys described above, using cross-sectional (facility specific) information, and time series information (monthly billing data and survey data), and incorporating external effects (e.g., economic and weather effects) (id. at 37). The models all estimated average monthly kilowatthour ("KWH") consumption, either seasonally adjusted or seasonally unadjusted

[24] While the telephone survey included questions designed to gather information about free-drivership levels, the resulting answers to those questions did not indicate any significant difference among participants (Exh. Co-5, at 34).

(Exh. DPU-1-2).[25] The Companies claim that the results of the billing analysis support the results of the inspected engineering analysis. For the 162 facilities included in the billing analysis, the savings estimated were 19.6 gigawatt hours ("GWH") per year,[26] and the inspected engineering savings results (for those 162 facilities) were 20 GWH per year (Exh. Co-5, at 12).

3. Application

The Companies separated participating facilities into three categories: (1) those facilities where results from post-installation inspections were made available to the Companies' evaluation consultant and where some telephone surveys had occurred (Exh. Co-8, at 2.103); (2) those facilities where post-installation inspections had taken place but where the results were not made available to the Companies' consultant and where no telephone surveys were conducted (id. at 2.103-2.104); and (3) those facilities where no post-installation inspections had taken place and no telephone surveys were conducted (id. at 2.104). A different method was used to calculate savings for each category, respectively: (1) by conducting on-site post-installation

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[25] Some models estimated monthly consumption in KWH per square foot.

[26] The 19.6 GWH per year value is the midpoint of a range of 15.7 to 23.5 GWH per year predicted at a 90 percent confidence level.

inspections and adjusting for free riders as determined through the telephone survey (id.); (2) by multiplying the inspection-adjusted engineering estimates for each facility by a net-to-gross adjustment factor, developed through the Companies' telephone surveys of the first category, that reflected free rider estimates (id.);[27] and (3) by using original engineering estimates, adjusted first by the net-to-gross factor described above and then by a second adjustment factor that reflected the ratio of inspected-adjusted savings to original engineering savings (id. at 2.104).[28]

The Companies claimed that the inspection-adjusted engineering estimates reported in the Companies' filing reflect actual post-installation operating data gathered through the Companies' inspection activities (Exh. Co-5, at 5). The Companies also claimed that the results of the billing analysis are consistent with the inspection-adjusted engineering estimates (id. at 5-6).

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[27] The net-to-gross ratio is defined as the ratio of total inspected engineering savings net of free riders to total inspected engineering savings. The net-to-gross factor was 90.4 percent for Commonwealth and 87.2 percent for Cambridge (Exh. Co-8, at 2.103-2.104, 2.65-2.66).

[28] For Commonwealth's service territory, this adjustment factor was 76 percent (Exh. Co-8, at 2.104). For Cambridge's service territory, this adjustment factor was 70 percent (id. at 2.66).

4. Analysis and Findings

The Department generally expects savings estimates to be based on pre- and post-installation measurements. In this case, the Companies based 93 percent of estimated savings on post-installation on-site inspection estimates, adjusted for estimated free riders (Exh. DPU-4-14; Exh. DPU-RR-13). The remainder of the savings estimates were based on original engineering estimates, adjusted to reflect inspection results from other facilities, and free-rider estimates. The Department notes that the inspection-adjusted estimates were consistent with the estimates produced by the billing analysis. In this case, approximately 95 percent of Commonwealth's and 75 percent of Cambridge's estimated savings were due to lighting measures.

The record shows that the Companies performed three separate activities that reduce the bias of the savings estimates. First, the results of the billing analysis were consistent with the engineering estimates. The Companies developed several models that incorporated non-program effects such as economic changes and changes to building parameters. The results of these models showed some stability. Second, 93 percent of Commonwealth's and 68 percent of Cambridge's savings estimates were based on the results of on-site inspections, with some including end-use metering and others including site-specific estimates of hours of use based on operator surveys (id.). Third, free-

rider estimates were determined through telephone surveys of participants.

The Department finds that, because the savings estimates for a large percentage of participants were based on the results of on-site inspections, and these savings were supported by the billing analysis data, the savings estimates for those participants are sufficiently unbiased. In addition, the Department finds that, because of the method of application, the large sample of facilities inspected, and the concurring results of the econometric analysis, the Companies acted appropriately in applying the results of the inspection adjusted engineering estimates to those participant facilities that were not inspected.

The Companies stated that persistence of savings was accounted for in the adjustments to energy savings, based on detailed on-site inspections. The Department notes that, to properly account for savings persistence, a company must periodically assess persistence over the projected lifetime of the installed ECMs. The Department finds that the Companies' inspection activities sufficiently accounted for savings persistence to date. The Companies are expected to continue to review persistence over the expected lives of the installed measures. In addition, the Department expects the Companies to use more actual measurements of hours and loads, including more pre-

retrofit data, in future impact evaluations. For purposes of this proceeding, the Department accepts the CRP energy savings estimates reported by the Companies.

E. C/I Direct Investment Program

1. Introduction

The Small C/I Program was implemented by the Companies from April 1990 through October 1991 (Exh. DPU-2-1). The program provided for the direct installation of energy-efficient lighting equipment to small and medium-sized commercial and industrial customers (Exh. Co-6, at 4-1). The Companies stated that energy-efficient fluorescent lamps and ballasts accounted for over 75 percent of the installed ECMs (id.).

The Company reported savings estimates for the Small C/I Program for the years 1990 and 1991 (Exh. DPU-1-1). Savings estimates for both years were developed based on the results of billing analyses that compared the pre- and post-installation energy consumption of a sample of customers who participated in the program during the respective years (the "participant groups") to the pre- and post-installation energy consumption of a sample of non-participants (the "comparison groups") (Exh. Co-4, at 3). The Companies stated that the members of the participant groups were selected using a "saturation sample approach," in which all program participants for which key

information was available were included in the participant groups (id.).[29] The members of the comparison groups were selected from the list of customers on the program's waiting list (id.).

2. 1990 Savings Estimates

The participant group for the 1990 billing analysis included 1,251 program participants, out of a total of 1,919 customers who participated in the program during August 1990 through December 1990 (Exh. Co-17, at 2; Exh. DPU-5-17). The comparison group consisted of 259 customers who were on the program's waiting list and who had "acceptable billing data" (Exh. Co-4, at 3). The pre-installation period was October 1988 through September 1989. The post-installation period was October 1990 through September 1991 (Exh. Co-17, at 3).[30] The results of the billing analysis indicated that the average energy consumption of the participant group decreased from 12.17 KWH per square foot of floor area during the pre-installation period to 10.30 KWH per square foot of floor area during the post-installation period, a decrease of 1.87 KWH per square

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29 This information included floor area data, Company-determined savings estimates, and sufficient energy consumption data for the pre- and post-installation periods (Exh. Co-4, at 3).

30 The Companies indicated that "anomalous" billing data were seen during November and December 1991, so these months were excluded from the billing analysis (Exh. Co-17, at 3).

foot of floor area (id. at 6). During the same time periods, the average energy consumption of the comparison group decreased from 7.72 KWH per square foot of floor area to 7.58 KWH per square foot of floor area, a decrease of 0.14 KWH per square foot of floor area (id. at 6).[31] The Companies stated that, by subtracting the change in consumption of the comparison group from the change in consumption of the participant group, they calculated average net energy savings estimates of 1.73 KWH per square foot of floor area, or approximately 14 percent of the average pre-installation energy consumption of the participant group (Exh. Co-6, at 5-6). The reported precision of the savings estimates was ±.335 KWH at the 90 percent confidence level (Exh. DPU-5-15).

The Companies stated that the savings estimates produced by the billing analysis were approximately 45 percent of the engineering estimates reported by the service contractors (i.e., the billing analysis produced a realization rate of 45 percent) (Exh. Co-17, at 4). The

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[31] The impact evaluation report stated that the average pre-installation consumption of the comparison group was approximately 60 percent of the average pre-installation consumption of the participant group (Exh. Co-17, at 3). The report stated that the absolute change in consumption was used, rather than the percentage change, because the "change in energy use of the control group cannot be distinguished from zero with reasonable confidence" (id. at 3).

Companies determined net program savings for 1990 by applying the realization rate of 45 percent to the engineering estimates for the total population of 1990 participants (Exh. Co-8, at 2.99). This resulted in net savings estimates of 10,864 MWH for ECMs installed during 1990 (id. at 2.99-2.102).

3. 1991 Savings Estimates

The participant group for the 1991 billing analysis included 2,184 program participants, out of a total of 3,018 customers who participated in the program during 1991 (Exh. DPU-2-1). The comparison group consisted of 253 customers who were on the program's waiting list and who had "acceptable billing data" (Exh. Co-4, at 3). The pre-installation period was the calendar year 1990. The post-installation period was the calendar year 1992 (Exh. DPU-2-4). The results of the billing analysis indicated that the average energy consumption of the participant group decreased from 8.25 KWH per square foot of floor area during the pre-installation period to 7.46 KWH per square foot of floor area during the post-installation period, a decrease of 0.79 KWH per square foot of floor area (Exh. Co-4, at 6). During the same time periods, the average energy consumption of the comparison group decreased from 8.21 KWH per square foot of floor area to 8.14 KWH per square foot of floor area, a decrease of 0.07 KWH per square foot of floor area (id.). The Companies stated that, by

subtracting the change in consumption of the comparison group from the change in consumption of the participant group, they calculated an average net energy savings estimate of 0.72 KWH per square foot of floor area, or approximately 9 percent of the average pre-installation energy consumption of the participant group (Exh. Co-6, at 5-6). The reported precision of the savings estimates was ±.216 KWH at the 90 percent confidence level (Exh. DPU-5-14).

The billing analysis produced a realization rate of approximately 25 percent (Exh. Co-6, at 7). The Companies determined net energy savings for this program in 1991 by applying the realization rate of 25 percent to the engineering savings estimates calculated for the entire population of 1991 participants (Exh. Co-8, at 2.99). This resulted in net savings estimates of 10,120 MWH for ECMs installed during 1991 (id. at 2.99-2.102).

4. Persistence of Savings

The Companies presented two studies that assessed the persistence of savings resulting from the installation of ECMs through the Small C/I Program. The first savings persistence study involved the use of a billing analysis of a sample of 1000 customers who participated in the program from August through December 1990 (Exh. Co-4, at 7).[32]

[32] In order to be included in the participant group, a participant was required to have "adequate" data to allow calculations of savings

The billing analysis included a comparison group of 264 non-participants. This billing analysis was conducted in two stages. First, the analysis compared the 1991 energy consumption of the two groups with their 1989 consumption (id. at 7-8). Second, the analysis compared the 1992 energy consumption of the two groups with their 1991 consumption (id.). The Companies' consultants stated that the results of the billing analysis "indicated that the savings for 1990 participants showed persistence and remained essentially stable" (id. at 10). The second savings persistence study was conducted as part of the Companies' customer survey activities (Exh. Co-6, at 4-13 through 4-15). The Companies reported measure removal rates for six lighting measure categories (id. at 4-14).[33] The Companies stated that, for the most commonly-installed measures, high efficiency fluorescent and compact fluorescent, the removal rates were 25.9 percent and 45.6 percent, respectively (id.). The Companies stated that they applied the persistence results of the billing analysis, rather than the survey results, because the billing analysis utilized significantly larger samples than the surveys (RR-DPU-23).

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to be made (Exh. Co-4, at 7).

[33] These categories were high efficiency fluorescent, compact fluorescent, high intensity discharge fixtures, outdoor HID, exit signs, and sensors (Exh. Co-6, at 4-14).

5. Analysis and Findings

The record shows that the Companies determined net energy savings estimates for the Small C/I Program for measures installed during 1990 and 1991 based on the results of billing analyses that compared the pre- and post-installation energy consumption of a sample of program participants and non-participants. The record shows that the Companies determined total net annual energy savings by applying the realization rates produced by the billing analyses to the engineering savings estimates developed for the entire population of program participants.

The Department previously has found that a billing analysis of program participants that employs a comparison group "can provide accurate estimates of energy savings at modest expense, while controlling for free riders ...." D.P.U. 90-261, at 103. The Department has identified the poor selection of samples used in savings measurement analyses as a source of bias in the savings estimates produced by the analyses. D.P.U. 91-44, at 138. In order to find that the samples included in the billing analyses have been selected in such a way as to minimize the bias of savings estimates, the Department must find that (1) the participant group is sufficiently representative of the entire population of program participants, and (2) the comparison group is sufficiently representative of the participant group. The

Department finds that, because the participant groups in both billing analyses included all program participants who had key information available, the participant groups are sufficiently representative of the entire population of program participants. In addition, the Department finds that, because the comparison groups in both billing analyses were selected from the program's waiting list, the comparison group is sufficiently representative of the participant group.[34]

However, the record shows that, for the 1990 billing analysis, the Companies did not adjust the change in energy consumption for the comparison group to reflect the fact that the average pre-installation energy consumption of the comparison group was approximately 40 percent less than the average pre-installation consumption of the participant group.[35] The Department finds that the failure to make this adjustment introduced an upward bias in the savings estimates. Therefore, the Department does not accept the 1990 annual savings estimates for this program. The Companies are directed to recalculate the 1990 savings estimates based on a revised realization rate that is calculated using consumption data for the comparison group that is

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[34] In particular, selecting the comparison group in this manner addresses the problem of self selection.

[35] The Department notes that the Companies made this adjustment when determining the net savings estimates in the RESH and HWGU Programs.

adjusted to reflect the difference in the level of pre-installation consumption of the participant and comparison groups. The Companies are directed to submit the revised 1990 savings estimates in their compliance filing, as set forth in the Order section, below.

Finally, the record shows that, to assess the persistence of savings of measures installed during 1990, the Companies performed a billing analysis that examined energy consumption of a sample of 1990 participants during 1991 and 1992. The Companies claimed that the results of the billing analysis, which indicated 100 percent persistence, are more reliable than the result of the Companies' customer surveys, which indicated measure removals. The Department acknowledges that there is not a single "correct" method to use to assess the persistence of savings. In this proceeding, the Department finds acceptable the results of the billing analysis indicating that the savings persisted over the time period studied. However, in the final reconciliation of savings estimates, the Companies are directed to reconcile the difference between the results of the billing analysis and the customer survey data.

The Department notes that the Companies intend to perform another billing analysis of 1991 participants. The Department finds that, because no measures have been installed in nearly three years, and because this sector will be served by service providers selected

through the IRM process, there is no justification for the Companies to incur future billing analysis expenditures. Therefore, the Companies are directed to focus their M&E activities on inspections that will assist in assessing savings persistence.

F. Residential Electric Space Heat Program

1. Description

The Companies began enrolling customers in the RESH Program in December 1989 (Exh. Co-2, at 1), and submitted RESH Program impact evaluations for the years 1990 through 1992, inclusive (id. at 2). The Companies stated that the RESH Program was designed to encourage residential customers who use electric space heating and who consume electricity in excess of 14,000 KWH annually to maximize electricity savings through the installation of energy-efficiency measures (id.).[36] The Companies stated that RESH Program DSM services were provided to 1,238 customers during the 1990 program

[36] The Companies indicated that delivery of measures in the RESH Program was divided into two phases (Exh. Co-2, at 7). Phase I included low-cost infiltration, interior lighting, and domestic hot water measures (id.). Phase II measures included attic, basement, and wall insulation upgrades, window and door improvements, air sealing measures, lighting improvements, and set-back thermostats (id.).

year, 1,975 customers during the 1991 program year, and 1,427 customers during the 1992 program year (id. at 14, 26, and 38).[37]

The Companies reported RESH Program annual energy savings estimates of 972 MWH for measures installed during the 1990 program year, 2,262 MWH for measures installed during the 1991 program year, and 1,394 MWH for measures installed during the 1992 program year (Exh. DPU-1-1, at 2).[38] Gross energy savings estimates for each program year were developed by conducting a billing analysis comparing pre- and post-installation electricity consumption of a sample of program participants (the "participant group") (Exh. Co-2, at 11).[39] Net energy

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[37] The Companies indicated that each RESH Program participant received Phase I measures during an initial visit by a RESH Program technician. During the Phase I visit, a technician performed an assessment of the energy-saving potential of the home to determine whether it would qualify for Phase II measures. If the home qualified for Phase II, additional measures were installed on a date subsequent to the Phase I delivery (Exh. Co-2, at 2). For purposes of the impact evaluation, RESH Program participants were divided into groups according to the calendar year (or years) in which they received Phase I and Phase II measures (id.).

[38] The Companies stated that RESH Program savings estimates for 1992 were preliminary because some of the data necessary for the billing analysis were not available in time for inclusion in the Companies' 1994 Impact Evaluation Filing to the Department (Exh. DPU-1-18).

[39] For customers that received Phase I measures in 1990, the pre-treatment period extended from December 1988 to November 1989, and the post-treatment period extended from January 1991 to December 1991 (Exh. CO-2, at 19). For customers that received Phase I measures in 1991, the pre-treatment period extended from

savings estimates for each program year were developed by comparing billing analysis results for the participant group to those of a sample of non-participants (the "comparison group"), and subtracting the average change for the comparison group from the average change for the participant group (id.).[40,41] The Companies stated that they calculated total net energy savings estimates for participants of both Phase I and Phase II by multiplying the net savings per customer by the total number of Phase I and Phase II participants (Exh. DPU-5-2b).

January 1990 to December 1990, and the post-treatment period extended from January 1992 to December 1992 (id. at 33). For customers that received Phase I measures in 1992, the pre-treatment period extended from January 1991 to December 1991, and the post-treatment period extended from January 1993 to December 1993 (id. at 43).

40 The Companies stated that, in addition to the billing analysis, they developed engineering estimates of energy savings for measures installed through the RESH Program from 1990 through 1992 (Exh. DPU-1-17). The Companies further stated that the engineering estimates of savings were not formally used in the estimation of net savings because of a relatively weak correlation between the engineering estimates of savings and the results of the billing analysis (id.).

41 The Companies indicated that the methodology for estimating net savings of participants that received only Phase I measures differed somewhat from the methodology used to estimate net savings of those who received both Phase I and Phase II measures (Exh. Co-2, at 23, 34, and 48). The Companies stated that, because electricity consumption of the comparison group was generally higher than that of the participants that received only Phase I measures, regression analyses were used to adjust pre-installation period consumption of the comparison group to more closely match the Phase I-only participant group (id. at 24, 35, and 48).

The Companies stated that they constructed the participant group for each program year by (1) compiling a database of all customers that received RESH Program measures in the program year being analyzed; and (2) deleting the data pertaining to customers that had less than twelve monthly billing records during either the pre- or post-treatment periods, greater than 60 percent change in energy consumption between the pre- and post-treatment periods, or "non-informative" billing records (Exh. Co-2, at 19-20, 32, and 43).[42] Data attrition due to these factors reduced the original participant group sample size from 496 customers to 308 customers -- a reduction of 38 percent -- in the program year 1990 billing analysis (id. at 20). Similarly, data attrition reduced the participant group sample size from 448 customers to 202 customers -- a reduction of 55 percent -- in the program year 1991 billing analysis (id. at 32). Finally, data attrition reduced the participant group sample size from 863 customers to 292 customers -- a

[42] The Companies stated that customers with "non-informative" billing records included seasonal residents with summer use only, customers with irregular usage patterns, flat-use customers that did not appear to be using electric space heating, and customers who appeared to have switched away from electric heat during the study period (Exh. Co-2, p. 20).

reduction of 66 percent -- in the program year 1992 billing analysis (id. at 44).[43]

The Companies' witness, Dr. Ljung, stated that deleting customers with aberrant consumption characteristics from the participant group was appropriate because similar deletions were made from the comparison group. Dr. Ljung further stated that she believed the participant group used in the billing analysis was representative of over 90 percent of the entire population of program participants, and that it would be difficult to include all participants' billing data without biasing the estimated net savings (Tr. at 80-86; Exh. DPU-5-2a).

The Companies stated that the comparison group for each program year was constructed from a random sample of customers on the residential electric heat rate who had not requested RESH Program services (Exh. DPU-1-18). The Companies then attempted to match the random sample to the participant group by deleting the data pertaining to customers with aberrant consumption characteristics or those that had less than twelve monthly billing records during either the pre- or

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[43] The Companies stated that the relatively small 1992 sample size may be explained by the fact that complete billing data were not available for use in the 1992 billing analysis (Exh. Co-2, at 44). The Companies indicated that they plan to update the results of the 1992 RESH Program billing analysis by the end of December 1994 to reflect an increased participant group sample size (id.; Exh. DPU-5-4).

post-treatment periods (id.). The Companies stated that the distribution of the pre-treatment energy consumption for all remaining customers was plotted and compared to the consumption distributions for the participant group, and that further deletions were made to achieve a closer match between the comparison and participant groups (id.).

The Companies stated that they conducted billing analyses to estimate persistence of RESH Program measure savings beyond one year for participants from program years 1990 and 1991 (Exh. Co-2, at 56).[44] The Companies' analyses of measure persistence indicated that savings increased slightly over time for the participants who received Phase I and Phase II measures in 1990 or 1991, and decreased slightly for the participants who received both Phase I and Phase II measures in 1991 (id. at 57).

The Companies stated that its consultant, XENERGY Inc., conducted a survey of RESH Program participants in February 1994 to assess both the level of free-ridership among participants and the

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[44] The Companies stated that they analyzed billing data from (1) 1991, 1992, and 1993 to estimate persistence of savings of Phase I and Phase II measures that were installed in 1990; (2) 1992 and 1993 to estimate persistence of savings in cases where Phase I measures were installed in 1990 and Phase II measures were installed in 1991; and (3) 1992 and 1993 to estimate persistence of savings of Phase I and Phase II measures that were installed in 1991 (Exh. CO-2, at 56-57).

persistence of some of the measures installed through the program (Exh. Co-6, at iv). The Companies further stated that the RESH Program billing analysis adequately accounted for the effects of free riders and measure removal rates, and that the billing analysis provided an accurate reflection of persistence of savings (Exh. DPU-5-9). The Companies indicated that factoring an additional reduction of savings into their estimates based on survey results would constitute a double-counting of measure removals (id.).

2. Analysis and Findings

The record in this case shows that the Company based its estimate of RESH Program energy savings on the results of a billing analysis of program participants and non-participants in which the composition of the comparison group was adjusted to match the energy consumption profile of the participant group. The Department previously has found that billing analysis of program participants that employs a comparison group "can provide accurate estimates of energy savings at modest expense, while controlling for free riders ...." D.P.U. 90-261, at 103. The Department has identified the poor selection of samples used in savings measurement analyses as a source of bias in the savings estimates produced by the analyses. D.P.U. 91-44, at 138.

In order to find that the samples included in the billing analyses have been selected in such a way as to minimize the bias of savings

estimates, the Department must find that the participant group is sufficiently representative of the entire population of program participants and that the comparison group is sufficiently representative of the participant group. The Department finds that the Companies' methodology for adjusting the composition of the comparison group until its consumption characteristics closely matched those of the participant group was appropriate, and that, therefore, the comparison group is sufficiently representative of the participant group. Regarding the issue of the participant group being sufficiently representative of the entire population of program participants, the Department notes that the Companies deleted from the billing analysis participants with aberrant energy consumption characteristics. However, the record in this case indicates that the Companies' RESH Program billing analysis incorporated data pertaining to all participants whose billing records were largely representative of the entire population of participants. Thus, the Department finds, for the purposes of this review, that the energy savings estimates produced by the billing analysis are sufficiently unbiased. However, in order for the Department to approve the impact evaluation in the Companies' next filing, the Companies must furnish evidence that they have analyzed alternative methodologies that explicitly account for savings among

customers not included in the RESH Program billing analysis, e.g., seasonal customers or customers with flat usage patterns.

The Department notes that the Companies included a large number of participants and non-participants in the billing analysis. The Department further notes that the Companies deleted data pertaining to customers with incomplete billing records, a greater than 60 percent change in energy consumption during the pre- or post-treatment periods, or "non-informative" billing records. The Department finds that the Companies' methodology for deleting these data and constructing the participant sample was appropriate, and that the methodology contributed to the precision of the Companies' savings estimates. Accordingly, the Department finds, for the purposes of this review, that the savings estimates were measured to a sufficient level of precision. However, the Department directs the Companies to reconcile 1992 savings estimates based on an updated billing analysis that incorporates more complete participant group billing data.

Based on the above analysis, the Department finds that the 1994 impact evaluation for the RESH Program satisfies the criteria established by the Department for the review of such evaluations and, accordingly, accepts the Companies' RESH Program savings estimates for 1990 through 1992, inclusive.

G. HWGU Program

1. Description

The Companies stated that the HWGU Program was designed to improve the efficiency of operation of several end uses in the residential sector, including water heating, lighting, cooling, and appliances (Exh. Co-3, at 3). The program is targeted at residences of one to four units that do not have electric heat, but rather use electricity for water heating and/or general use (i.e., lighting and appliances) (id.).

The Companies reported savings estimates for this program for the years 1990 through 1994 (Exh. Co-8, at 2.78). Net savings estimates for the years 1990 through 1992 were developed through billing analyses that compared the pre- and post-installation energy consumption of a sample of program participants (the "participant group") to the pre- and post-installation energy consumption of a sample of non-participants (the "comparison group") (Exh. Co-3, at 21). The Companies stated that, for each year, all participants were initially included in the participant groups. The participant group was then refined to include only those residences where the customer who was served through the program was still residing at the same location (id.

at 21).[45] In addition, the Companies removed from the participant group those participants (1) with fewer than twelve months of pre-installation consumption and (2) whose energy consumption had changed by more than 3,000 KWH or 60 percent between the pre- and post-installation periods (id. at 33).

The Companies stated that, to ensure that the comparison group served as a proxy for the participant group, the members of the comparison group were selected based on three criteria: (1) energy consumption during the previous twelve months; (2) the rate on which a customer is billed; and (3) the ratio of winter consumption to total consumption (id. at 22-23).[46] The participant group for each year was stratified by these criteria and the comparison group was selected so that the number of members in each stratum for the comparison group was proportional to the number of such customers in the participant group (id. at 22-23).

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[45] The Companies stated that this was done to ensure that changes in energy consumption between the pre- and post-installation periods were not attributable to differences in tenancy (Exh. Co-3, at 23). The Companies stated that additional work has been planned to determine savings estimates where tenancy changes caused a loss of baseline consumption (id.).

[46] The Companies stated that the ratio of winter to total consumption was important to identify seasonal customers (Exh. Co-3, at 22-23).

To assess the persistence of savings for measures installed during 1990 and 1991, the Companies performed billing analyses which compared the pre-installation energy consumption of a sample of program participants in those years to the energy consumption during the second and third years after installation (id. at 66).

To develop savings estimates for Commonwealth's service territory, the Companies applied the average savings per participant, as indicated by each year's billing analyses, to the entire population of program participants in that year. For savings estimates for 1993 and 1994, the Companies used the results of the 1992 billing analysis (Exh. Co-8, at 2.63).

To develop savings estimates for Cambridge's service territory, the Companies applied the average savings per participant, as indicated by the 1992 billing analysis, to the entire population of program participants in that year. The Companies stated that the 1990 and 1991 billing analyses did not produce statistically significant savings estimates. The Companies stated that they applied "the most conservative persistence factor" derived from the billing analyses conducted on participants in Commonwealth's service territory to the savings estimates produced by the 1992 billing analysis of participants in Cambridge (id. at 2.63).

2. Analysis and Findings

The record shows that the Companies determined net energy savings estimates for the HWGU Program for measures installed between 1990 and 1992 based on the results of billing analyses that compared the pre- and post-installation energy consumption of a sample of program participants and non-participants. The Department previously has found that a billing analysis of program participants that employs a comparison group "can provide accurate estimates of energy savings at modest expense, while controlling for free riders ...." D.P.U. 90-261, at 103. The Department has identified the poor selection of samples used in savings measurement analyses as a source of bias in the savings estimates produced by the analyses. D.P.U. 91-44, at 138.

In order to find that the samples included in the billing analyses have been selected in such a way as to minimize the bias of savings estimates, the Department must find that the participant group is sufficiently representative of the entire population of program participants and that the comparison group is sufficiently representative of the participant group. The Department finds that, because the participant groups in both billing analyses included all program participants who had key information available, the participant groups are sufficiently representative of the entire

population of program participants. In addition, the Department finds that, because the participant and comparison groups were matched and stratified based on criteria that reflect consumption patterns, the comparison group is sufficiently representative of the participant group.

The Department finds that the savings estimates for the HWGU Program are sufficiently unbiased and measured to a sufficient level of precision. Therefore, the Department accepts the savings estimates as reported.

III. PROPOSED CC RATES

A. Introduction

The Companies submitted their proposed CC rates on June 3, 1994 (Exh. Co-10, at 6). The CC rates are composed of three components: projected DSM expenditures (the Companies disaggregated these expenditures are divided into "direct" and "indirect assignment" expenditures) for the period July 1994 through June 1995; projected lost base revenue for the period July 1994 through June 1995; and a reconciling adjustment of over- and under-recoveries of DSM expenditures through June 30, 1994 (Exh. Co-12, Schedules D and I).

B. Projected DSM Expenditures

1. Introduction

The Companies stated that projected DSM expenditures consist of three primary components (Exh. Co-11, at 2.4). The first component includes "committed" expenditures "that relate to ongoing C&LM activities that have been approved in the past by the Department" (id.). The second component includes those expenditures incurred in the context of the Companies' IRM DSM solicitation process (id. at 2.7). The third component includes expenditures incurred as part of the Companies' participation in the C&LM Task Force established pursuant to the Settlement approved by the Department in D.P.U. 91-80 Phase Two-A (id. at 2.4).

2. Committed Expenditures

a. Introduction

The committed expenditure category includes direct expenses associated with implementation of the RESH Program, the HWGU Program, the Small C/I Program, the CRP, and the Conservation Voltage Regulation ("CVR") Program (id. at 2.5-6). In addition, the committed expenditure category includes "the amortization of deferred DSM expenditures previously incurred, including interest, in compliance with the findings of the Department in D.P.U. 91-80 Phase Two-A" (id. at 2.6).

b. RESH and HWGU Program Expenditures

The Companies' proposed CC rates include RESH and HWGU Program expenditures that are based on the assumption that "enrollment for these programs will terminate on June 30, 1994 with the advent of new IRM DSM programs" (id. at 2.5). The Companies stated that, accordingly, installation and inspection expenses included in the proposed CC rates relate solely to activities to serve customers that have enrolled prior to June 30, 1994 (id.). The Companies stated that, in addition, evaluation activities for past program implementation will continue during the upcoming CC period (id.).

In their D.P.U. 91-234 Phase IV Supplemental Filing, submitted to the Department on June 21, 1994, the Companies revised their proposal for the RESH Program so that, although they would continue to refrain from marketing the RESH Program, they would provide implementation services to customers who contact the Companies to participate in the RESH Program at any time prior to September 30, 1994 (Exh. Co-19, at 3). The Department accepted the Companies' proposal in D.P.U. 91-234-C. See D.P.U. 91-234-C at 4. Therefore, the Department directs the Companies to revise the projected installation and inspection expenditures for the RESH Program to reflect their proposal and to submit the revised expenditure projections in their compliance filing, as set forth in the Order section, below. As a final matter regarding projected RESH Program expenditures, the Department finds

that the M&E expenditures are consistent with the Companies' obligation to develop reliable savings estimates for these programs and, therefore, approves the level of M&E expenditures included in the proposed CC rates for the RESH Program.

With respect to the HWGU Program, the Department finds that the installation and inspection expenditures are consistent with the Department's directives in D.P.U. 91-234-B. In addition, the Department finds that the M&E expenditures are consistent with the Companies' obligation to develop reliable savings estimates for this program. Therefore, the Department approves the level of HWGU Program expenditures included in the proposed CC rates.

c. Small C/I Program Expenditures

The Companies stated that the Small C/I Program expenditures included in the proposed CC rates reflect persistence inspection and evaluation activities for past program implementation (id. at 2.6). In Section II.D.2, above, the Department found that expenditures for future billing analyses of 1991 participants are not justified. Therefore, the Department does not approve those expenditures that would be incurred as part of the Companies' evaluation activities. Therefore, the Department directs the Companies to revise the projected expenditures for the Small C/I Program to include only those expenditures that relate to inspection activities and to submit the revised expenditure

projections in their compliance filing, as set forth in the Order section, below.

d. CRP Expenditures

The Companies stated that CRP expenditures included in the proposed CC rates reflect rebate payments as well as inspection and evaluation costs (id. at 2.6). The Department finds that the CRP rebate expenditures are consistent the Department's directives in D.P.U. 91-80 Phase Two-A. In addition, the Department finds that the inspection and evaluation expenditures are consistent with the Companies' obligation to develop reliable savings estimates for this program. Therefore, the Department approves the level of CRP expenditures included in the proposed CC rates.

e. CVR Expenditures

The Companies indicated that they expect to incur expenses of $405,000 on Commonwealth's system and $52,000 on Cambridge's system to implement the CVR program during the twelve-month period from July 1, 1994 to June 30, 1995 (Tr. 2, at 66). The Companies proposed to include such costs within their rate base at the time of their next base rate proceedings (id. at 61). In the interim, the Companies proposed to include within the upcoming CC rates $124,000 which comprises $85,000 for carrying charges applied to the investment in CVR monitoring equipment, $27,000 for computer modeling

software and hardware leasing costs, and $12,000 for telephone line equipment leasing necessary to implement CVR (Exh. Co-11, at 2.6, 2.43). The Companies stated that they propose not to recover all CVR expenses in the next twelve-month period because of their concerns for rate impacts on their customers (Tr. 2, at 61).

The Department acknowledges the Companies' concern with rate impacts expressed through their proposal to not expense the total CVR budget in a single year. The Department, however, finds the Companies' request to recover carrying charges on a material asset prior to the placement of that asset in rate base to be contrary to Department policy. See Oxford Water Company, D.P.U. 1219 at 4 (1983); Boston Edison Company D.P.U. 906 at 208 (1982); Bay State Gas Company, D.P.U. 1122 at 19 (1982). The Department further finds that, unlike other DSM programs, these expenditures will provide the Companies with depreciable assets which can be incorporated in base rates. Accordingly, the Department denies the Companies' request to recover carrying charges associated with CVR monitoring equipment investments through their proposed CC rates. The Department, however, will allow the Companies to expense the ongoing, non-depreciable costs (i.e., those associated with computer and telephone line leasing) in the amount of $39,000 and to recover this amount through their proposed CC rates. Therefore, the Department directs the

Companies to revise the projected expenditures for the CVR Program to include only those expenditures that are associated with computer and telephone line leasing and to submit the revised expenditure projections in their compliance filing, as set forth in the Order section, below.

f. Amortization of Deferred Expenditures

The Companies stated that committed expenditures include the amortization of deferred DSM expenditures previously incurred, "in compliance with the findings of the Department in D.P.U. 91-80 Phase Two-A" (Exh. Co-11, at 2.6).[47] The Department finds that these expenditures are consistent with the provisions of the Settlement approved by the Department in that Order. Therefore, the Department approves the level of amortized expenditures included in the proposed CC rates.

3. IRM Expenditures

The second component of the proposed CC rates includes expenditures incurred in the context of the Companies' IRM DSM solicitation process (Exh. Co-11, at 2.7). These expenditures include the direct payments that are projected to be made to winning bidders in the

[47] The Companies noted that the level of amortization included in the proposed CC rates reflects the prepayment of $775,000 of the deferred expenditures, as approved by the Department in a letter dated March 29, 1994 (Exh. Co-11, at 2.6).

solicitation process, expenditures for measurement and verification ("M&V") activities related to the implementation of IRM DSM programs, expenditures associated with certain DSM consulting services (e.g., IRM impact and process evaluation planning), and estimates of M&V equipment leasing expenses (id. at 2.8-9). Included in this category are expenditures associated with the Super Efficient Refrigerator Program ("SERP") (id. at 2.7).

The Department finds that the dollar amounts included in the Companies' CC rate calculations related to IRM program expenditures (see id. at 3.32-3.33 and 3.54-3.55, columns 3 and 4) are consistent with the dollar amounts presented by the Companies in their June 3, 1994 IRM Phase III compliance filing.[48] However, as of June 30, 1994, the Companies have not successfully executed contracts with all award group bidders included in the Companies' June 3 filing. In addition, in D.P.U. 91-234-C, the Department preapproved SERP, but did not preapprove the new construction programs that were proposed by the Companies and that were included in the Companies' award group. The Department finds that it is appropriate to include in the CC rates only those expenditures associated with Department-approved contracts and with Department-preapproved programs. Therefore, the

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[48] The Companies' June 3, 1994 IRM Phase III compliance filing was approved by the Department on June 16, 1994.

Department directs the Companies to revise their projected IRM expenditures to include only those expenditures associated with Department-approved contracts and with SERP. The Department directs the Companies to submit the revised projections of IRM expenditures with their compliance filing, as set forth in the Order section, below.

4. DPU 91-80 Task Force Expenditures

a. Description

In D.P.U. 93-15/16-A, the Department disallowed $1,636,410 in expenditures incurred by the Companies through their involvement in the C&LM Task Force process, established by the Settlement approved by the Department in D.P.U. 91-80 Phase Two-A. Id. at 36. In the current proceeding, the Companies have requested recovery of $606,023 of those expenditures through their proposed CC rates (Exh. Co-11, at 2.10). The Companies stated that they included only those Task Force expenditures that provided "tangible benefits" to customers as a result of the programs that actually will be implemented through the IRM process (id.).

The Task Force expenditures are divided into two categories: (1) program design expenditures, and (2) general contract support expenditures (Exh. Co-8, at 2.202-205). The Companies have requested the recovery of $87,680 in expenditures related to the design of

programs that will be operational over the time period addressed by their current IRM process: SERP, the Residential New Construction Programs, and the C/I New Construction Programs (id. at 2.200-201). The Companies stated that, since these programs will be operational during the twelve-month period, they will provide direct benefits to ratepayers. In addition, the Companies requested recovery of $54,796 in design expenditures for the Independent Savings Supplier ("ISS") Program (id. at 2.201-202). The Companies claimed that, even though this program will not be operational during the IRM period, the program served as the model for developing the DSM RFP issued in IRM. The Companies stated that, in addition, this program served as a backup to the RFP if no bids were received for this market sector (id. at 2.201-202).

The Companies also requested recovery of expenditures associated with general contract support provided by two consultants, Metzler and Associates ($160,805), and MORE Systems ($302,742) (id. at 2.203). The Companies stated that Metzler provided the Companies with "critical information fundamental to making reasonable and informed decisions in the area of conservation policies and guidelines, implementing procedures and practices, and supporting information systems" (id. at 2.203). The Companies stated that the expenditures

made to MORE Systems were required to adapt the MORE System to the Companies' specifications (id.).

b. Analysis and Findings

In D.P.U. 93-15/16-A, the Department stated that, "[a]lthough the Companies' work with the Task Force may produce tangible benefits to their ratepayers at a future date (e.g., in the form of program designs submitted as part of the Companies' C&LM resource portfolio in ... their ... IRM proceeding), the programs ... have not been implemented; thus, ratepayers are receiving no benefits from these programs at the present time." Id. at 35. In order to approve the Companies' proposal to recover a portion of the Task Force expenditures, the Department must find that the activities associated with those expenditures are providing benefits to their ratepayers.

With respect to the Residential and C/I New Construction Programs, the Department did not preapprove these programs in D.P.U. 91-234-C. Therefore, the Department finds that these programs are not providing benefits to ratepayers and denies recovery of Task Force-related expenditures associated with these programs. With respect to SERP, the Department notes that this program was designed through a nationwide consortium of utility companies, appliance manufacturers, and the Environmental Protection Agency. Thus, the Department finds that it is inappropriate for the Companies to recover

Task Force-related expenditures associated with the design of SERP. Therefore, the Department denies recovery of Task Force-related expenditures associated with SERP. Finally, with respect to the ISS Program, the Department finds that, because the program will not be implemented through IRM and the Companies have not sufficiently demonstrated that these expenditures will provide direct benefits to ratepayers, it is inappropriate for the Companies to recover Task Force-related expenditures associated with the design of the ISS Progam. Therefore, the Department denies the recovery of these expenditures.

Regarding the general contract support expenditures, the Department finds that, although the Companies claimed that these expenditures were instrumental in developing a reliable database for DSM, these expenditures are more appropriately accounted for as rate base assets. Therefore, the Department denies the recovery of these expenditures through the CC rates.[49]

C. Lost Base Revenues

1. Initial Reconciliation and Original Projection of LBR

[49] The Department notes that, in their next base rate proceedings, the Companies will have the opportunity to demonstrate the appropriateness of including these investments in rate base.

The LBR included in the Companies' proposed CC rates are composed of two components: (1) the initial reconciliation of LBR for the period January 1993 through June 1994, and (2) original projections of LBR for the period July 1994 through June 1995 (Exh. Co-12, at 3.24-25).

The initial reconciliation is based on the savings estimates reported in the Companies' M&E Report (Exh. Co-1, at 1-7). The savings estimates for each company reflect ECMs that have been installed since the end of the company's most recent test year (id.).[50] In addition, the initial reconciliation of LBR was calculated using an LBR decimal that reflects the Companies' determination that a component of the Companies' base rate revenues is avoided as a result of the implementation of the DSM programs, and thus, reduces slightly the LBR (Exh. Co-12, Sch. B and G).

The Department finds that the LBR for measures previously installed were based on savings estimates that are consistent with the results of the Companies' impact evaluations. The Department notes that, in Section II.E, above, the Companies were directed to submit revised savings estimates for measures installed in the 1990 Small C/I

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[50] For Commonwealth, the most recent test year ended June 30, 1990. For Cambridge, the most recent test year ended June 30, 1992.

Program. Here, the Companies are directed to revise the LBR calculation to reflect this directive.

The Department finds that the LBR for measures installed through programs selected through the IRM process (see Exh. Co-11, at 3.32-3.33 and 3.54-3.55, column 5) are consistent with the KWH savings presented by the Companies in their June 3, 1994 IRM Phase III compliance filing.[51] However, in Section III.B.3, above, the Department allowed recovery only for those expenditures associated with Department-approved contracts and Department-preapproved programs. The Department finds that, similarly, LBR should be recovered only for Department-approved contracts and Department-preapproved programs. Therefore, the Department directs the Companies to recalculate LBR based on savings projected to result from Department-approved contracts and Department-preapproved programs. The Department directs the Companies to submit the revised LBR with their compliance filing, as set forth in the Order section, below.

2. Inclusion of Test Year Savings

The original projections of LBR for the upcoming CC period reflect savings estimates from (1) measures already installed through

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[51] The Companies' June 3, 1994 IRM Phase III compliance filing was approved by the Department on June 16, 1994.

the Companies' existing DSM programs, and (2) measures projected to be installed through the DSM programs selected through the IRM process (id. at 2.60-63). Savings estimates for measures previously installed are based on the results of the Companies' impact evaluations. In this proceeding, the Companies have proposed to recover LBR for ECMs installed during the test year (Exh Co-8, at 2.16-18). The Companies testified that, because these measures were installed during the test year, the resultant savings were not fully accounted for in the determination of test year KWH sales (id.).

a. Companies' Proposal

The Companies proposed to modify the current mechanism to recover LBR, as approved by the Department in D.P.U. 93-15/16, to allow for recovery of a portion of the savings resulting from measures installed during the test year period (Exh. Co-8, at 2.17). The Companies stated that their proposal meets the Department's goal that LBR recovery "restore the assumed relationship between sales levels and revenue requirements that were used in setting the rates before an electric company began achieving savings from its [DSM] programs" (id. at 2.18, citing Western Massachusetts Electric Company, D.P.U. 89-260, at 105).

The Companies noted that, consistent with the LBR recovery methodology approved in D.P.U. 93-15/16, they did not propose to

reconcile for the savings that accrued during the period January 1, 1993 through June 30, 1994 due to DSM implemented during the test year period (id. at 2.17). The Companies proposed to recover LBR due to DSM implemented during the test year period only for savings that accrue during the period July 1, 1994 through June 30, 1995 (id.). The Companies calculated that the dollar value of LBR associated with savings due to DSM implemented during the test year period was $35,793 for Cambridge and $565,713 for Commonwealth (Exh. DPU-4-15).

b. Analysis and Findings

In Boston Edison Company, D.P.U. 91-233-A, the Department determined that it is appropriate to allow recovery of LBR associated with DSM implemented during a test year period. Id. at 14-15. In the instant case, the Department finds that DSM measures implemented during the test year period are not adequately accounted for in the Companies' current LBR recovery methodology. Accordingly, the Department approves the Companies' proposal to recover LBR associated with DSM implemented during the test year period.

3. Reduction of LBR by Avoided Costs

a. Introduction

In D.P.U. 93-15/16, the Department questioned whether the current methodology used to calculate the LBR decimal accurately

reflects the lost fixed costs associated with saved demand and energy sales. Id. at 9. The Department, however, determined that any move to establish a new methodology for recovery of LBR could not be determined based on the record in that proceeding. Id. Accordingly, the Department directed the Companies to provide an analysis of the fixed cost recovery actually foregone due to DSM program implementation, including an analysis of non-fuel variable costs that may go unrecovered due to reduced energy sales. Id.

b. Companies' Proposal

In the instant proceeding, the Companies proposed to adjust the LBR calculation to reflect a credit for non-fuel variable operation and maintenance ("O&M") costs that the Companies have determined are avoided as a result of DSM activities (Exh. Co-9, at 3.7). The Companies note that other than this adjustment, the LBR decimals were calculated in the same manner as approved in D.P.U. 93-15/16 (id.). The Companies calculated a modest non-fuel variable O&M credit of $0.00103 for all customers within Commonwealth's service territory, and $0.00122 for all customers within Cambridge's service territory (id. at Sch. A at 4-5; Sch. F at 4-5).[52]

[52] For major customer sectors within each service territory the non-fuel variable O&M credit represents between a 1.5 percent and 3.5 percent reduction in the LBR decimal associated with a particular customer sector (id.).

The Companies calculated the non-fuel variable O&M credit by simulating the dispatch of their generating units within an "own-load dispatch model" based on the load curve and generating unit portfolio assuming no interconnections with other utilities (id., WP 1, at 3). The own-load dispatch model allows the Companies to calculate the avoidable non-fuel variable O&M costs associated with the production of power at the margin from the Companies' own generating units and other generating units from which the Companies purchase power (id. at 2).

The Companies also reviewed the extent to which energy and capacity savings due to DSM implementation will result in the avoidance of transmission and distribution ("T&D") costs (id. at 4). The Companies stated that T&D costs are incurred in an uneven or "lumpy" manner because T&D facilities are installed in fixed increments of capacity which are meant to satisfy load growth for relatively long periods of time (id.). The Companies also stated that avoided T&D costs are appropriately internalized in the rate-setting process through less frequent and smaller base rate increases in the future, and that avoided T&D costs should not result in changes to existing LBR recovery rates (id.). The Companies' analysis determined that there would be no reductions in T&D investments during the one-year period

covered by the projected CC rates and that, therefore, they could make no adjustments to the LBR factors for that time period.

c. Analysis and Findings

The Department finds that the Companies' filing in the instant proceeding is consistent with our directive in D.P.U. 93-15/16 to provide an analysis of the fixed cost recovery actually foregone due to DSM program implementation, including an analysis of non-fuel variable costs that may go unrecovered due to reduced energy sales. For the purposes of this proceeding, the Department accepts the Companies' LBR decimal calculations, which include a credit for non-fuel variable O&M costs. However, the Department may further examine this issue in future CC proceedings.

IV. ORDER

Accordingly, after notice, hearing and due consideration, it is hereby

ORDERED: That the lifetime savings estimates reported by Cambridge Electric Light Company and Commonwealth Electric Company for DSM installations are approved in part and denied in part, as set forth above; and it is

FURTHER ORDERED: That the Companies shall file a compliance filing on or before July 7, 1994. The compliance filing shall contain recalculations of the Companies' savings estimates consistent with the directives set forth in this Order. The compliance filing also shall contain recalculations of the Companies' LBR, based on the revised savings estimates. Finally, the compliance filing shall contain recalculations of the Companies' CC rates consistent with the directives set forth in this Order.

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FURTHER ORDERED: That the Companies shall comply with all other directives contained herein.

By Order of the Department,

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Kenneth Gordon, Chairman

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Barbara Kates-Garnick, Commissioner

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Mary Clark Webster, Commissioner

Appeal as to matters of law from any final decision, order or ruling of the Commission may be taken to the Supreme Judicial Court by an aggrieved party in interest by the filing of a written petition praying that the Order of the Commission be modified or set aside in whole or in part.

Such petition for appeal shall be filed with the Secretary of the Commission within twenty days after the date of service of the decision, order or ruling of the Commission, or within such further time as the Commission may allow upon request filed prior to the expiration of twenty days after the date of service of said decision, order or ruling. Within ten days after such petition has been filed, the appealing party shall enter the appeal in the Supreme Judicial Court sitting in Suffolk County by filing a copy thereof with the Clerk of said Court. (Sec. 5, Chapter 25, G.L. Ter. Ed., as most recently amended by Chapter 485 of the Acts of 1971).

COMMONWEALTH

Rate Class	Reconciliation	Expenses		LBR	Tot	Prop CC Rate	Curr. CC Rate
		Direct	Indirect				
R1	(113,755)	327,000	14,000	311,601	538,846	.043	-.013
R3	(130,239)	654,000	13,000	220,202	756,963	.198	.104
G1	175,981	607,000	62,000	2,010,652	2,855,633	.338	.298
G3	(76,335)	1,203,000	59,000	1,186,715	2,372,380	.296	.193
TOT	(144,348)	2,791,000	148,000	3,729,169	6,523,821		

(Compliance Filing at 3.49-50).

CAMBRIDGE

Rate Class	Reconciliation	Expenses		LBR	Tot	Prop CC Rate c/KWH	Curr. CC Rate c/KWH
		Direct	Indirect				
R1	36,512	72,000	9,000	12,326	129,838	.087	.037
R3	(4,347)	1,000	0	0	(3,347)	-.029	.032
G1	22,165)	93,000	11,000	70,212	196,377	.089	.169
G3	(608,024)	642,000	38,000	(30,873)	41,104	.004	(.056)
TOT	(553,419)	808,000	58,000	51,665	364,246		

(Compliance Filing at 3.22-23).